Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the above-referenced application. In accordance with 37 C.F.R. 1.121, as revised January 21, 2004, claims are labeled as "Original", "Currently amended", "Canceled", "Withdrawn", "Previously presented", "New", or "Not entered".

Listing of Claims:

1. (Previously Presented) A method for the combinatorial biosynthesis of one or more compounds comprising:
    a) providing one or more starter units, wherein said one or more starter units have incorporated therein a functional handle that reacts with a functionality present on a solid support unit, the starter units being accepted as substrates for one or more modular biosynthetic enzymatic machinery systems;
    b) attaching said one or more starter units to a solid support unit to provide one or more support bound starter units;
    c) providing said one or more support bound starter units to said one or more biosynthetic enzymatic machinery systems *in vitro* to generate a collection of template structures, wherein the biosynthetic enzymatic machinery system is selected from the group consisting of natural and modified polyketide synthases, natural and modified peptide synthetases, natural and modified terpene synthases, and natural and modified animal fatty acid synthases;
    d) functionalizing said template structures using synthetic organic chemistry; and
    e) repeating steps c) and/or d) until a desired support bound collection of structures is generated.

2. (Original) The method of claim 1 further comprising functionalizing said support bound collection of structures generated in step e) to provide a support bound collection of unnatural natural products.

3. (Previously Presented) A method for the combinatorial biosynthesis of one or more compounds comprising:

a) providing one or more starter units, wherein said one or more starter units have incorporated therein a functional handle that reacts with a functionality present on a solid support unit, the starter units being accepted as substrates for one or more modular biosynthetic enzymatic machinery systems;

b) attaching said one or more starter units to a solid support unit to provide one or more support bound starter units;

c) providing said one or more support bound starter units to said one or more biosynthetic enzymatic machinery systems *in vitro* to generate a collection of template structures, wherein the biosynthetic enzymatic machinery system is selected from the group consisting of natural and modified polyketide synthases, natural and modified peptide synthetases, natural and modified terpene synthases, and natural and modified animal fatty acid synthases; and

d) functionalizing said collection of template structures to provide a support bound collection of unnatural natural products.

4. (Canceled)

5. (Previously Presented) The method of claim 1 further comprising the step of cleaving said support bound collection of structures from said solid support unit.

6. (Previously Presented) The method of claim 2 or 3 further comprising the step of cleaving said support bound collection of unnatural natural products from said solid support unit.

7. (Previously Presented) The method of claim 1, 2 or 3 wherein the functional handle is a functionality which includes an alkyne, an olefin or an iodoalkene group.

8. (Previously Presented) The method of claim 1, 2 or 3 wherein the step of attaching the starter units to the solid support unit is effected by a chemical reaction which includes Glaser coupling, olefin metathesis or Stille coupling reaction.

9. (Previously Presented) The method of claim 1, 2 or 3 wherein the biosynthetic enzymatic machinery systems comprise one or more naturally-occurring synthetic enzymes.

10. (Previously Presented) The method of claim 9 wherein the biosynthetic enzymatic machinery systems comprise one or more enzymes which include fatty acid synthase, polyketide synthase, peptide synthetase or terpene (or isoprenoid) synthase.

11. (Previously Presented) The method of claim 1, 2 or 3 wherein the biosynthetic enzymatic machinery systems comprise one or more modified enzymes.

12. (Previously Presented) The method of claim 11 wherein the modified enzyme is a genetically modified enzyme.

13. (Previously Presented) The method of claim 11 wherein the modified enzyme is a class I polyketide synthase enzyme.

14. (Previously Presented) The method of claim 1, 2 or 3 wherein one or more starter units is purified via antibody recognition.

15. (Previously Presented) The method of claim 1, 2 or 3 wherein one or more template structures is purified via antibody recognition.

16. (Previously Presented) The method of claim 1, 2 or 3 wherein the step of functionalizing said template structures is carried out using combinatorial techniques including, but not limited to, parallel synthesis and split-and-pool synthesis.

17. (Previously Presented) The method of claim 1, 2 or 3 wherein the step of functionalizing the template structures includes attaching a biomolecule to said template structures.

18. (Previously Presented) The method of claim 17 wherein the biomolecule includes polysaccharides, nucleic acids, peptides, and polymers.

19. (Previously Presented) The method of claim 1, 2 or 3 further comprising the step of recording the reaction history using an encoding technique.

20. (Previously Presented) The method of claim 19 wherein the encoding technique is selected from the group consisting of spatial encoding techniques, graphical encoding techniques, chemical encoding techniques and spectrometric encoding techniques.

21. (Previously Presented) The method of claim 20 wherein the spectrometric encoding technique is selected from the group consisting of mass spectroscopy, fluorescence emission and nuclear magnetic resonance spectroscopy.

22. (Previously Presented) A combinatorial biosynthesis method of preparing one or more compounds comprising the steps of:

a) reacting one or more amino acid derivatives with a solid support via a Glaser coupling, olefin metathesis or a Stille coupling, wherein the amino acid derivative includes a functional handle selected from the group consisting of an alkyne, olefin and iodoalkene groups and the solid support includes one or more alkyne or olefin groups, to form support bound amino acid derivatives;

b) catalyzing an *in vitro* reaction between two or more amino acid derivatives using a peptide synthetase, thereby generating a collection of template structures;

c) functionalizing said template structures using one or more reaction selected from the group consisting of nucleophilic addition, functionalization of hydroxyl groups with electrophiles, Buchwald-Hartwig aminations, Heck coupling, Stille coupling, Sonogashira/Catro-Stephens coupling, Suzuki coupling, carbonylations, Mitsunobu reaction, hydroacylation, azide cycloaddition, nitrone cycloaddition, nitrile oxide cycloaddition, and combinations thereof; and

d) optionally repeating steps b) and/or c), wherein at least one of the amino acid derivatives is bound to a solid support, thereby forming a collection of support bound compounds.

23. (Previously Presented) A combinatorial biosynthesis method of preparing one or more compounds comprising the steps of:

a) reacting one or more thioester derivatives with a solid support via a Glaser coupling, olefin metathesis or a Stille coupling, wherein the thioester derivative includes a functional handle selected from the group consisting of an alkyne, olefin and iodoalkene groups and the solid support includes one or more alkyne or olefin groups, to form support bound thioester derivatives;

b) catalyzing an *in vitro* reaction between two or more thioester derivatives using a polyketide synthase, thereby generating a collection of template structures;

c) functionalizing said template structures using one or more reaction selected from the group consisting of nucleophilic addition, functionalization of hydroxyl groups with electrophiles, Buchwald-Hartwig aminations, Heck coupling, Stille coupling, Sonogashira/Catro-Stephens coupling, Suzuki coupling, carbonylations, Mitsunobu reaction, hydroacylation, azide cycloaddition, nitrone cycloaddition nitrile oxide cycloaddition, and combinations thereof; and

d) optionally repeating steps b) and/or c), wherein at least one of the thioester derivatives is bound to a solid support, thereby forming a collection of support bound compounds.